

What is claimed :

- 1 1. A torque-transmitting assembly comprising:
  - 2 a) a female coupling member with a bore;
  - 3 b) a radially flexible member, received within the bore, defining a hollow shape with an
  - 4 opening; and
  - 5 c) an elongated shaft member made of a super-elastic alloy, received within the opening,
  - 6 whereupon relative motion among at least two of the members causes the radially
  - 7 flexible member to contact the shaft, inducing a super-elastic activation in the shaft that
  - 8 urges the shaft and radially flexible member into surface-to-surface contact, securing the
  - 9 members together in a fixed relative position.
- 1 2. The assembly of Claim 1 wherein the radially flexible member has an external surface
- 2 that frictionally engages the bore upon relative motion.
- 1 3. The assembly of Claim 1 wherein the shaft is tubular with a cannulation.
- 1 4. The assembly of Claim 3 wherein the bore of the female coupling member further
- 2 comprises a cannulation aligned with the shaft cannulation, for common passage of a
- 3 guide wire there through.
- 1 5. The assembly of Claim 1 further comprising an inter-positional polymer sleeve for
- 2 transmitting bending stress in the assembly.
- 1 6. The assembly of Claim 1 wherein the contact occurs in one or more areas that
- 2 frictionally carries the applied torque.

- 1 7. The assembly of Claim 6 wherein the contact area is calibrated so that the contact slips  
2 at a preset torque before the failure strength of the shaft is reached.
- 1 8. The assembly of Claim 1 wherein the female coupling member further comprises a  
2 counter-bore and the radially flexible member has an exterior surface adapted for  
3 engagement within the counter-bore.
- 1 9. The assembly of Claim 8 wherein the radially flexible member is compressed within  
2 the counter-bore.
- 1 10. The assembly of Claim 1 wherein the female coupling member is a fitting that  
2 connects the assembly to a cutting tool-bit or powered instrument.
- 1 11. The assembly of Claim 1 wherein the female coupling member further comprises a  
2 fitting with a cutting tool-bit.
- 1 12. The assembly of Claim 11 wherein the assembly is further connected to a powered  
2 instrument.
- 1 13. The assembly of Claim 1 wherein the radially flexible member is a split collet.
- 1 14. The assembly of Claim 1, the radially flexible member being in the form of a collar  
2 and made of super-elastic alloy, wherein the relative motion further induces a super-  
3 elastic activation of the collar.
- 1 15. The assembly of Claim 1 wherein the collar further comprises a washer.
- 1 16. The assembly of Claim 15 wherein the collar further comprises a series of washers.
- 1 17. The assembly of Claim 14 wherein the super-elastic alloy is a nickel-titanium alloy.
- 1 18. A torque-transmitting coupling assembly comprising:

- 2 a) a split collet member having an exterior surface and an opening;
- 3 b) an elongated shaft member made of a super-elastic alloy, received within the opening;
- 4 and
- 5 c) a sleeve member having a bore that receives the exterior surface of the collet,
- 6 whereupon relative motion among at least two of the members causes the opening to
- 7 contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and
- 8 the collet into surface-to-surface contact, securing the members together in a fixed
- 9 relative position.

1 19. The assembly of Claim 18 wherein interfering engagement of the exterior surface

2 with the bore compresses the opening against the shaft, inducing the super-elastic

3 activation in the shaft.

1 20. The assembly of Claim 18 wherein the shaft is tubular with a cannulation.

1 21. The assembly of Claim 20 wherein either the sleeve or collet has a cannulation

2 aligned with the shaft cannulation, for common passage of a guide wire there through.

1 22. The assembly of Claim 18 further comprising an inter-positional polymer sleeve for

2 transmitting bending stress in the assembly.

1 23. The assembly of Claim 18 wherein the surface-to-surface engagement occurs along

2 one or more contact areas that frictionally carries the applied torque.

1 24. The assembly of Claim 23 wherein the contact area is calibrated to slip at a preset

2 torque before the failure strength of the shaft is reached.

1 25. The assembly of Claim 18 wherein the collet is connected to a cutting tool-bit or

2 powered instrument.

- 1 26. The assembly of Claim 18 wherein the collet further comprises a cutting tool-bit.
- 1 27. The assembly of Claim 26 further coupled to a powered instrument.
- 1 28. A torque-transmitting coupling assembly comprising:
- 2 a) a fitting member formed with a counter-bore;
- 3 b) a collar member made of super-elastic alloy, having an exterior surface and an
- 4 opening, the collar being located in the counter-bore; and
- 5 c) an elongated shaft member made of a super-elastic alloy, received within the opening;
- 6 whereupon relative motion between the fitting and the collar causes the collar to
- 7 contact the shaft, inducing a super-elastic activation in the shaft that engages the shaft
- 8 and collar into surface-to-surface contact, securing the members together in a fixed
- 9 relative position..
- 1 29. The assembly of Claim 28 wherein engagement of the exterior surface with the
- 2 counter-bore super-elastically compresses the opening against the shaft.
- 1 30. The assembly of Claim 29 wherein the collar further comprises a washer.
- 1 31. The assembly of Claim 30 further comprising a series of washers.
- 1 32. The assembly of Claim 28 wherein the super-elastic alloy is a nickel-titanium alloy.
- 1 33. The assembly of Claim 28 wherein the shaft is tubular with a cannulation.
- 1 34. The assembly of Claim 33 wherein the fitting has a cannulation aligned with the
- 2 shaft cannulation, for common passage of a guide wire there through.

1 35. The assembly of Claim 28 further comprising an inter-positional polymer sleeve for  
2 transmitting bending stress in the assembly.

1 36. The assembly of Claim 29 wherein the frictional engagement occurs along one or  
2 more contact areas that frictionally carries the applied torque.

1 37. The assembly of Claim 36 wherein the contact area is calibrated so that the coupling  
2 slips at a preset torque before the fatigue strength of the shaft is reached.

1 38. The assembly of Claim 28 wherein the fitting is connected to a cutting tool-bit or  
2 powered instrument.

1 39. The assembly of Claim 28 wherein the fitting further comprises a cutting tool-bit.

1 40. The assembly of Claim 39 further coupled to a powered instrument.

1 41. A method of forming a torque-transmitting assembly, comprising the steps of:

2 a) providing a female coupling member with a bore;

3 b) providing a radially flexible member with an external surface and an opening, situating  
4 the radially flexible member within the bore

5 c) providing an elongated shaft member made of a super-elastic alloy, received within the  
6 opening; and

7 d) relatively moving at least two of the members, causing the radially flexible member to  
8 contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and  
9 radially flexible member into surface-to-surface contact, securing the members together  
10 in a fixed relative position.

1 42. The method of Claim 41 wherein step d) further comprises frictionally engaging the  
2 members along a contact area that carries the applied torque, the contact area being  
3 calibrated to slip at a preset torque before the failure strength of the shaft is reached.

1 43. The method of Claim 42 further comprising the steps of providing the female  
2 coupling member with a counter-bore, providing the radially flexible member in the form  
3 of a collar made of super-elastic alloy and inducing a super-elastic activation in the  
4 collar.

1 44. The method of Claim 42 wherein step a) further comprises providing a radially  
2 flexible member in the form of a split collet.

1 45. A flexible surgical reamer having a torque-transmitting assembly and comprising:

2 a) a fitting member formed with a counter-bore and including a cutting tool-bit;

3 b) a collar member made of super-elastic alloy, located in the counter-bore; and

4 c) an elongated shaft member made of a super-elastic alloy, adapted for receipt within the  
5 collar;

6 whereupon relative motion among the members causes the opening to contact the  
7 shaft, inducing a super-elastic activation in the shaft that urges the shaft and the collar  
8 into surface-to-surface contact, securing the members together in a fixed relative position.

1 46. The reamer of Claim 45 wherein the collar is an annular member.

1 47. The reamer of Claim 46 wherein the collar further comprises a washer.

1 48. The reamer of Claim 47 wherein the collar further comprises a series of washers.

1 49. The reamer of Claim 48 wherein the collar is pre-assembled with the fitting.

1 50. The reamer of Claim 45 further comprising an inter-positional polymer sleeve for  
2 transmitting bending stress in the assembly.

1 51. The reamer of Claim 45 wherein the contact occurs along an area that frictionally  
2 carries the applied torque.

1 52. The reamer of Claim 51 wherein the contact area is calibrated to slip at a preset  
2 torque before the failure strength of the shaft is reached.

1 53. The reamer of Claim 45 wherein the shaft is tubular, with a cannulation.

1 54. The reamer of Claim 53 wherein the fitting has a cannulation that aligns with the  
2 shaft cannulation for passage of a guide wire through the reamer.

1 55. A flexible surgical reamer having a torque-transmitting assembly and comprising:

2 a) a radially flexible member having a split collet with an exterior surface and an  
3 opening, and including a cutting tool-bit;

4 b) an elongated shaft member made of a super-elastic alloy, received within the opening;  
5 and

6 c) a sleeve having a bore that receives the exterior surface,

7 whereupon relative motion among the members causes the opening to contact the shaft,  
8 inducing a super-elastic activation in the shaft that urges the shaft and the collet into  
9 surface-to-surface contact, securing the members together in a fixed relative position.

1 56. The reamer of Claim 55 wherein the exterior surface is compressed by the bore,  
2 further contracting the opening against the shaft to induce the super-elastic activation.

1 57. The reamer of Claim 55 wherein the shaft is tubular with a cannulation for passage of  
2 a guide wire there through.

1 58. The reamer of Claim 56 wherein the opening interferingly receives the shaft and is  
2 expanded to compress the exterior surface against the bore.

1 59. The reamer of Claim 55 further comprising an inter-positional polymer sleeve for  
2 transmitting bending stress in the assembly.

1 60. The reamer of Claim 55 wherein the contact occurs along an area that frictionally  
2 carries the applied torque.

1 61. The reamer of Claim 60 wherein the contact area is calibrated to slip at a preset  
2 torque before the failure strength of the shaft is reached.

1 62. The reamer of Claim 61 wherein the shaft is further connected to a powered  
2 instrument.

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